

Civil Engineering and Architecture					
Course Description					
<i>Civil Engineering and Architecture is the study of the design and construction of residential and commercial building projects. The course includes an introduction to many of the varied factors involved in building design and construction including building components and systems, structural design, storm water management, site design, utilities and services, cost estimation, energy efficiency, and careers in the design and construction industry.</i>					
Program of Study to which the course applies	Course Code				
STEM:	100162				
	Course Content	Reference Standards	Academic Crosswalk to Common Core Standards	Academic Crosswalk to Nebraska Standards	Comments
Standard 1	Students will understand the history of Civil Engineering and Architecture.	PLTW-CEA			
Benchmark 1.1	Recognize many features of ancient structures are seen in modern buildings.	PLTW-CEA			
Sample Performance Indicator 1.1.1	Connect modern structural and architectural designs to historical architectural and civil engineering achievements.	PLTW-CEA			
Benchmark 1.2	Describe how architectural style of is often an important key to understanding how a community of neighborhood has developed and the aesthetic customs that have formed over time.	PLTW-CEA	ELA.WHST.11-12.2.b ELA.SL.11-12.4	LA.12.2.1.b LA.12.3.1.a	When students <i>describe</i> information or ideas, they communicate their knowledge through either speaking or writing. To demonstrate full knowledge on the topic, students' presentations must include all the main ideas and relevant details on the subject (CC: ELA.WHST.11-12.2.b, ELA.SL.11-12.4; NE: LA.12.2.1.b, LA.12.3.1.a).

Sample Performance Indicator 1.2.1	Identify three general categories of structural systems used in historical buildings.	PLTW-CEA			
Sample Performance Indicator 1.2.2	Determine architectural style through identification of building features, components, and materials.	PLTW-CEA			
Benchmark 1.3	Understand the multiple architectural styles that have been developed throughout history are an indication of changing needs of people and society and uses for space.	PLTW-CEA			
Sample Performance Indicator 1.3.1	Explain how historical innovations have contributed to the evolution of civil engineering and architecture.	PLTW-CEA			
Benchmark 1.4	Identify how visual design principles and elements constitute an aesthetic vocabulary that can be used to describe buildings and may contribute to their function, location, or time period.	PLTW-CEA	ELA.RST.11-12.4 MTH.G.MG.3	LA.12.1.5 MA.12.2.4.a	
Sample Performance Indicator 1.4.1	Identify and explain the application of principles and elements of design to architectural buildings.	PLTW-CEA			
Sample Performance Indicator 1.4.2	Create a mock-up model depicting an architectural style or feature using a variety of materials. .	PLTW-CEA			
Standard 2	Students will identify careers in civil engineering and architecture.	PLTW-CEA			

Benchmark 2.1	Understand how civil engineers and architects apply math, science, and discipline-specific skills to design and implement solutions.	PLTW-CEA			
Sample Performance Indicator 2.1.1	Identify the primary duties, and attributes of a civil engineer and an architect along with the traditional path for becoming a civil engineer or architect.	PLTW-CEA			
Sample Performance Indicator 2.1.2	Identify various specialty disciplines associated with civil engineering.	PLTW-CEA			
Benchmark 2.2	Recognize civil engineering and architecture careers are comprised of several specialties and offer creative job opportunities for individuals with a wide variety of backgrounds and goals.	PLTW-CEA	ELA.RST.11-12.4	LA.12.1.5	
Sample Performance Indicator 2.2.1	Identify the primary duties, and attributes of a civil engineer and an architect along with the traditional path for becoming a civil engineer or architect.	PLTW-CEA			
Sample Performance Indicator 2.2.2	Identify various specialty disciplines associated with civil engineering.	PLTW-CEA			

Benchmark 2.3	Describe how civil engineers are problem solvers involved in the design and construction of a diverse array of projects in a wide range of disciplines including structural, environmental, geotechnical, water resources, transportation, construction and urban planning.	PLTW-CEA	ELA.WHST.11-12.2.b ELA.SL.11-12.4	LA.12.2.1.b LA.12.3.1.a	When students <i>describe</i> information or ideas, they communicate their knowledge through either speaking or writing. To demonstrate full knowledge on the topic, students' presentations must include all the main ideas and relevant details on the subject (CC: ELA.WHST.11-12.2.b, ELA.SL.11-12.4; NE: LA.12.2.1.b, LA.12.3.1.a).
Sample Performance Indicator 2.3.1	Identify the primary duties, and attributes of a civil engineer and an architect along with the traditional path for becoming a civil engineer or architect.	PLTW-CEA			
Sample Performance Indicator 2.3.2	Identify various specialty disciplines associated with civil engineering.	PLTW-CEA			
Benchmark 2.4	Describe how architects primarily focus on designing the interior and exterior "look-and-feel" of commercial and residential structures meant for human habitation.	PLTW-CEA	ELA.WHST.11-12.2.b ELA.SL.11-12.4	LA.12.2.1.b LA.12.3.1.a	When students <i>describe</i> information or ideas, they communicate their knowledge through either speaking or writing. To demonstrate full knowledge on the topic, students' presentations must include all the main ideas and relevant details on the subject (CC: ELA.WHST.11-12.2.b, ELA.SL.11-12.4; NE: LA.12.2.1.b, LA.12.3.1.a).
Sample Performance Indicator 2.4.1	Identify the primary duties, and attributes of a civil engineer and an architect along with the traditional path for becoming a civil engineer or architect.	PLTW-CEA			

Benchmark 2.5	Appreciate how an effective method for brainstorming possible solutions involves a collaboration of many stakeholders with a variety of skills coming together in an organized meeting called a charrette.	PLTW-CEA	ELA.SL.11-12.1	LA.12.3.3	
Sample Performance Indicator 2.5.1	Participate in a design charrette and recognize the value of using a charrette to develop innovative solutions to support whole building design.	PLTW-CEA		SC.12.1.3.a	
Sample Performance Indicator 2.5.2	Understand the relationship among the stakeholders involved in the design and construction of a building project	PLTW-CEA			
Standard 3	Students will understand building design and construction.	PLTW-CEA			
Benchmark 3.1	Understand that many residential structures are constructed with wood framing systems and are built using standard practices.	PLTW-CEA			
Sample Performance Indicator 3.1.1	Identify typical components of a residential framing system.	PLTW-CEA			
Benchmark 3.2	Describe the variety of roof shapes and materials that are available for residential structures to address aesthetic preferences, carry design loads, and meet environmental challenges.	PLTW-CEA	ELA.WHST.11-12.2.b ELA.SL.11-12.4 MTH.G.MG.3	LA.12.2.1.b LA.12.3.1.a MA.12.2.4.b	When students <i>describe</i> information or ideas, they communicate their knowledge through either speaking or writing. To demonstrate full knowledge on the topic, students' presentations must include all the main ideas and relevant details on the subject (CC: ELA.WHST.11-12.2.b, ELA.SL.11-12.4; NE: LA.12.2.1.b, LA.12.3.1.a).

Sample Performance Indicator 3.2.1	Recognize conventional residential roof designs.	PLTW-CEA			
Sample Performance Indicator 3.2.2	Model a common residential roof design and detail advantages and disadvantages of that style.	PLTW-CEA			
Benchmark 3.3	Designers design, modify, and plan structures using 3D architectural software.	PLTW-CEA	ELA.RST.11-12.3 MTH.G.MG.3	LA.12.1.6.k LA.12.3.2 MA.12.2.4.b	Alignment presumes that students must comprehend oral or written instructions to complete the task (CC: ELA.RST.11-12.3; NE: LA.12.1.6.k, LA.12.3.2).
Sample Performance Indicator 3.3.1	Use 3D architectural software to create a small building.	PLTW-CEA			
		PLTW-CEA			
Standard 4	Students will understand cost and efficiency analysis.	PLTW-CEA			
Benchmark 4.1	Understand the combination of concrete and rebar, called reinforced concrete, is an important component of residential foundations.	PLTW-CEA			
Sample Performance Indicator 4.1.1	Apply principles of sustainable design to a small project.	PLTW-CEA			
Benchmark 4.2	Accurately determining the cost and quantities for a construction project can ensure a successful building providing a high quality structure with less material and financial waste.	PLTW-CEA		MA.12.1.3.a MA.12.1.3.d	
Sample Performance Indicator 4.2.1	Create a cost estimate for a small construction project, including a detailed cost break-down.	PLTW-CEA			
Sample Performance Indicator 4.2.2	Calculate the heat loss through one wall of a conditioned building.	PLTW-CEA			

Benchmark 4.3	Recognize an effective residential structure should include methods for adequate heating and cooling.	PLTW-CEA		MA.12.1.3.a MA.12.1.3.d	
Sample Performance Indicator 4.3.1	Calculate the heat loss through one wall of a conditioned building.	PLTW-CEA			
Sample Performance Indicator 4.3.2	Calculate the heat loss for a building envelope with given conditions appropriate for the project.	PLTW-CEA			
Benchmark 4.4	Apply R-value and U-factor measurements to select materials that with ensure a structure is properly insulated.	PLTW-CEA		MA.12.1.3.a MA.12.1.3.d SC.12.2.3.e	
Sample Performance Indicator 4.4.1	Calculate the heat loss through one wall of a conditioned building.	PLTW-CEA			
Sample Performance Indicator 4.4.2	Calculate the heat loss for a building envelope with given conditions appropriate for the project.	PLTW-CEA			
Standard 5	Students will understand residential design.	PLTW-CEA			
Benchmark 5.1	Describe how responsible designers maximize the potential of the property, minimize impact on the environment, and incorporate universal design concepts in order to create an attractive and functional space.	PLTW-CEA	ELA.WHST.11-12.2.b ELA.SL.11-12.4	LA.12.2.1.b LA.12.3.1.a SC.12.4.2.c	When students <i>describe</i> information or ideas, they communicate their knowledge through either speaking or writing. To demonstrate full knowledge on the topic, students' presentations must include all the main ideas and relevant details on the subject (CC: ELA.WHST.11-12.2.b, ELA.SL.11-12.4; NE: LA.12.2.1.b, LA.12.3.1.a).
Sample Performance Indicator 5.1.1	Apply elements of good residential design to the design of a basic house to meet the needs of a client.	PLTW-CEA			

Benchmark 5.2	Depict how responsible designers anticipate the needs and requirements of the users.	PLTW-CEA			
Sample Performance Indicator 5.2.1	Apply elements of good residential design to the design of a basic house to meet the needs of a client.	PLTW-CEA			
Benchmark 5.3	Understand how codes are created to protect the health and safety of the public dictate the minimum requirements that must be met in a building project, and constrain the location of structures, utilities, building construction, and landscape components placed on a site.	PLTW-CEA	ELA.RST.11-12.6	LA.12.1..6.k MA.12.2.4.a SC.12.4.3.c	
Sample Performance Indicator 5.3.1	Design a home design that complies with applicable codes and requirements.	PLTW-CEA			
Sample Performance Indicator 5.3.2	Incorporate sustainable building principles and universal design concepts into a residential design.	PLTW-CEA			
Sample Performance Indicator 5.3.3	Create bubble diagrams and sketch a floor plan.	PLTW-CEA			
Sample Performance Indicator 5.3.4	Identify residential foundation types and choose an appropriate foundation for a residential application.	PLTW-CEA			
Benchmark 5.4	Appropriate flow rate, pressure, and water quality are necessary for effective water supply and use.	PLTW-CEA		MA.12.1.3.a MA.12.1.3.d MA.12.2.4.a	

Sample Performance Indicator 5.4.1	Calculate the head loss and estimate the water pressure for a given water supply system.	PLTW-CEA			
Sample Performance Indicator 5.4.2	Create sketches to document a preliminary plumbing and a preliminary electrical system layout for a residence that comply with applicable codes.	PLTW-CEA			
Sample Performance Indicator 5.4.3	Design an appropriate sewer lateral for wastewater management for a building that complies with applicable codes.	PLTW-CEA			
Benchmark 5.5	Recognize when utilities are not available within a reasonable distance to be economically brought on site, substitutions must be designed and constructed.	PLTW-CEA			
Sample Performance Indicator 5.5.1	Create sketches to document a preliminary plumbing and a preliminary electrical system layout for a residence that comply with applicable codes.	PLTW-CEA			
Sample Performance Indicator 5.5.2	Design an appropriate sewer lateral for wastewater management for a building that complies with applicable codes.	PLTW-CEA			
Benchmark 5.6	Understand utilities and systems must be properly sized to minimize cost and appropriately serve the project and the structure occupants.	PLTW-CEA		MA.12.1.3.a MA.12.1.3.d MA.12.2.4.a	

Sample Performance Indicator 5.6.1	Calculate the head loss and estimate the water pressure for a given water supply system.	PLTW-CEA			
Sample Performance Indicator 5.6.2	Create sketches to document a preliminary plumbing and a preliminary electrical system layout for a residence that comply with applicable codes.	PLTW-CEA			
Sample Performance Indicator 5.6.3	Design an appropriate sewer lateral for wastewater management for a building that complies with applicable codes.	PLTW-CEA			
Benchmark 5.7	Illustrate how the design of electrical and plumbing systems must be carefully integrated into the architectural and structural design of a building.	PLTW-CEA		MA.12.1.3.a MA.12.1.3.d MA.12.2.4.a	
Sample Performance Indicator 5.7.1	Calculate the head loss and estimate the water pressure for a given water supply system.	PLTW-CEA			
Sample Performance Indicator 5.7.2	Create sketches to document a preliminary plumbing and a preliminary electrical system layout for a residence that comply with applicable codes.	PLTW-CEA			
Sample Performance Indicator 5.7.3	Design an appropriate sewer lateral for wastewater management for a building that complies with applicable codes.	PLTW-CEA			
Sample Performance Indicator 5.7.4	Create a site opportunities map and sketch a project site.	PLTW-CEA			

Sample Performance Indicator 5.7.5	Choose an appropriate building location on a site based on orientation and other site-specific information.	PLTW-CEA			
Benchmark 5.8	Understand how careful landscape design that takes into consideration local environmental conditions can improve energy efficiency, reduce noise, reduce water usage, reduce storm water runoff, and improve the visual impact of a building project	PLTW-CEA		MA.12.1.3.a MA.12.1.3.d MA.12.2.4.a SC.12.4.2.c	
Sample Performance Indicator 5.8.1	Choose an appropriate building location on a site based on orientation and other site-specific information.	PLTW-CEA			
Sample Performance Indicator 5.8.2	Calculate the storm water runoff from a site before and after development.	PLTW-CEA			
Sample Performance Indicator 5.8.3	Document the design of a home using 3D architectural design software and construction drawings.	PLTW-CEA			
Standard 6	Students will understand commercial building systems.	PLTW-CEA			
Benchmark 6.1	Distinguish between commercial building systems from residential building systems.	PLTW-CEA			
Sample Performance Indicator 6.1.1	Identify applicable building codes and regulations that apply to a given development.	PLTW-CEA			
Sample Performance Indicator 6.1.2	Classify a building according to its use, occupancy, and construction type using the International Building Code.	PLTW-CEA			

Sample Performance Indicator 6.1.3	Comply with specifications, regulations, and codes during a design process.	PLTW-CEA			
Benchmark 6.2	Recognize how codes and building regulations define and constrain all aspects of building design and construction including the structure, site design, utilities, and building usage.	PLTW-CEA	ELA.RST.11-12.6	LA.12.1.6.k	
Sample Performance Indicator 6.2.1	Comply with specifications, regulations, and codes during a design process.	PLTW-CEA			
Sample Performance Indicator 6.2.2	Compare a variety of commercial low-slope roof systems and select an appropriate system for a given commercial application based on materials, strength, durability, and cost, especially a green roof.	PLTW-CEA			
Sample Performance Indicator 6.2.3	Use load-span tables to design structural elements.	PLTW-CEA			
Benchmark 6.3	Investigate how zoning regulations are used to control land use and development.	PLTW-CEA	ELA.WHST.11-12.7-9	LA.12.1.6.j LA.12.4.1.a-c	The depth of students' investigations, and thus the research standards that apply, will be determined by the nature of the task (CC: ELA.WHST.11-12.7-9; NE: LA.12.1.6.j, LA.12.4.1.a-c)
Sample Performance Indicator 6.3.1	Research Land Use regulations to identify zoning designations and allowable uses of property.	PLTW-CEA			
Sample Performance Indicator 6.3.2	Comply with specifications, regulations, and codes during a design process.	PLTW-CEA			

Sample Performance Indicator 6.3.3	Compare a variety of commercial wall systems and select an appropriate, system for a given commercial application based on materials, strength, aesthetics, durability, and cost.	PLTW-CEA			
Sample Performance Indicator 6.3.4	Compare a variety of commercial low-slope roof systems and select an appropriate system for a given commercial application based on materials, strength, durability, and cost, especially a green roof.	PLTW-CEA			
Sample Performance Indicator 6.3.5	Use load-span tables to design structural elements.	PLTW-CEA			
Benchmark 6.4	Understand how wall, roof, floor, and framing systems for commercial facilities are chosen based on many factors.	PLTW-CEA	MTH.G.MG.3	MA.12.2.4.b	Alignment presumes that students will use geometric models to visualize 3D architectural design of wall, roof, floor, and framing systems (NE:MA.12.2.4.b).
Sample Performance Indicator 6.4.1	Compare a variety of commercial wall systems and select an appropriate, system for a given commercial application based on materials, strength, aesthetics, durability, and cost.	PLTW-CEA			

Sample Performance Indicator 6.4.2	Compare a variety of commercial low-slope roof systems and select an appropriate system for a given commercial application based on materials, strength, durability, and cost, especially a green roof.	PLTW-CEA			
Sample Performance Indicator 6.4.3	Use 3D architectural design software to incorporate revisions for the redesign of a commercial building design.	PLTW-CEA			
Sample Performance Indicator 6.4.4	Calculate the structural efficiency of a structure.	PLTW-CEA			
Sample Performance Indicator 6.4.5	Use load-span tables to design structural elements.	PLTW-CEA			
Standard 7	Students will understand structures.	PLTW-CEA			
Benchmark 7.1	Describe the purpose of a structure is to withstand all applied loads and forces and to transfer these forces to the Earth.	PLTW-CEA	ELA.WHST.11-12.2.b ELA.SL.11-12.4	LA.12.2.1.b LA.12.3.1.a	When students <i>describe</i> information or ideas, they communicate their knowledge through either speaking or writing. To demonstrate full knowledge on the topic, students' presentations must include all the main ideas and relevant details on the subject (CC: ELA.WHST.11-12.2.b, ELA.SL.11-12.4; NE: LA.12.2.1.b, LA.12.3.1.a).
Sample Performance Indicator 7.1.1	Use building codes and other resources to calculate roof loading to a structure and select appropriate roof beams to safely carry the load.	PLTW-CEA			

Benchmark 7.2	Comprehend how structural engineering involves the critical analysis of forces and loads, the anticipated effect of these loads on a structure, and the design of structural elements to safely and efficiently resist the anticipated forces and loads.	PLTW-CEA	MTH.N.VM.3	MA.12.1.3.a MA.12.1.3.d MA.12.2.4.a MA.12.2.4.b SC.12.2.2.a SC.12.2.2.b SC.12.2.2.c SC.12.2.2.d	Alignment presumes that students will make sketches using geometric objects and select appropriate methods to calculate roof loading as part of the critical analysis of forces and loads used in structural engineering (CC: MTH.N.VM.3; NE: MA.12.1.3.a, MA.12.1.3.d, MA.12.2.4.a).
Sample Performance Indicator 7.2.1	Use building codes and other resources to calculate roof loading to a structure and select appropriate roof beams to safely carry the load.	PLTW-CEA			
Sample Performance Indicator 7.2.2	Analyze a simply supported beam subjected to a given loading condition to determine reaction forces, sketch shear and moment diagrams, and determine the maximum moment resulting in the beam.	PLTW-CEA			
Sample Performance Indicator 7.2.3	Use beam formula to calculate end reactions and the maximum moments of a simply supported beam subjected to a given loading condition.	PLTW-CEA			
Benchmark 7.3	Design loads are often dictated by building codes.	PLTW-CEA		MA.12.1.3.a MA.12.1.3.d	Alignment presumes that students will make computation and select appropriate methods to calculate roof loading according to building codes (NE: MA.12.1.3.a, MA.12.1.3.d).
Sample Performance Indicator 7.3.1	Use building codes and other resources to calculate roof loading to a structure and select appropriate roof beams to safely carry the load.	PLTW-CEA			

Sample Performance Indicator 7.3.2	Use beam formula to calculate end reactions and the maximum moments of a simply supported beam subjected to a given loading condition.	PLTW-CEA			
Sample Performance Indicator 7.3.3	Use building codes and other resources to determine the required floor loading and design a structural steel floor framing system (beams and girders) for a given building occupancy.	PLTW-CEA			
Benchmark 7.4	Understand how structural design includes the determination of how structures disperse the applied loads.	PLTW-CEA	MTH.N.VM.3	MA.12.1.3.a MA.12.1.3.d SC.12.2.2.a SC.12.2.2.b SC.12.2.2.c SC.12.2.2.d SC.12.2.2.e	Alignment presumes that students will perform computations and select appropriate methods to calculate typical loads used in structural designs (CC: MTH.N.VM.3; NE: MA.12.1.3.a, MA.12.1.3.d).
Sample Performance Indicator 7.4.1	Identify and describe the typical usage of foundation systems commonly used in commercial construction.	PLTW-CEA			
Sample Performance Indicator 7.4.2	Determine the loads transferred from a steel framed structure to the ground through a foundation.	PLTW-CEA			

Benchmark 7.5	Describe how the application of loads to a building results in resisting forces from the structure which can be predicted through the use of mathematics and physical science principles.	PLTW-CEA	ELA.WHST.11-12.2.b ELA.SL.11-12.4	LA.12.2.1.b LA.12.3.1.a MA.12.1.3.a MA.12.1.3.d MA.12.2.5.b	When students <i>describe</i> information or ideas, they communicate their knowledge through either speaking or writing. To demonstrate full knowledge on the topic, students' presentations must include all the main ideas and relevant details on the subject (CC: ELA.WHST.11-12.2.b, ELA.SL.11-12.4; NE: LA.12.2.1.b, LA.12.3.1.a). Alignment presumes that students will apply appropriate units for spread footing and select computation methods to check structural calculations (NE: MA.12.1.3.a, MA.12.1.3.d, MA.12.2.5.b).
Sample Performance Indicator 7.5.1	Size a spread footing for a given loading condition.	PLTW-CEA			
Sample Performance Indicator 7.5.2	Check structural calculations created by others for correctness.	PLTW-CEA			
Standard 8	Students will understand services and utilities	PLTW-CEA			
Benchmark 8.1	Understand when utilities are not available within a reasonable distance to be economically brought on site, substitutions must be designed and constructed.	PLTW-CEA			
Sample Performance Indicator 8.1.1	Interpret and apply code requirements and constraints as they pertain to the installation of services and utilities.	PLTW-CEA			
Benchmark 8.2	Utilities and systems must be properly sized to minimize cost and appropriately serve and project.	PLTW-CEA		MA.12.2.5.b MA.12.2.5.c	

Sample Performance Indicator 8.2.1	Interpret and apply code requirements and constraints as they pertain to the installation of services and utilities.	PLTW-CEA			
Sample Performance Indicator 8.2.2	Read and understand HVAC construction drawings for a commercial project.	PLTW-CEA			
Benchmark 8.3	Responsible designers anticipate the needs and requirements of the users.	PLTW-CEA			
Sample Performance Indicator 8.3.1	Read and understand HVAC construction drawings for a commercial project.	PLTW-CEA			
Benchmark 8.4	The design of mechanical systems impact the architectural and structural design of a building.	PLTW-CEA			
Sample Performance Indicator 8.4.1	Read and understand HVAC construction drawings for a commercial project.	PLTW-CEA			
Benchmark 8.5	Energy codes are designed to conserve natural resources, reduce operating costs, protect the environment and create healthier living and working spaces. They dictate the minimum requirements for the building envelope, lighting, mechanical systems, and service water heating for commercial facilities.	PLTW-CEA	ELA.RST.11-12.6	LA.12.1.6.k SC.12.4.2.c SC.12.4.3.c	
Sample Performance Indicator 8.5.1	Apply criteria and constraints to size and locate the new utility service connections for a commercial facility.	PLTW-CEA			
Sample Performance Indicator 8.5.2	Modify system designs to incorporate energy conservation techniques.	PLTW-CEA			

Benchmark 8.6	The design of internal systems is documented with construction drawings specific to each system.	PLTW-CEA			
Sample Performance Indicator 8.6.1	Apply criteria and constraints to size and locate the new utility service connections for a commercial facility.	PLTW-CEA			
Sample Performance Indicator 8.6.2	Modify system designs to incorporate energy conservation techniques.	PLTW-CEA			
Standard 9	Students will understand the need for site considerations.	PLTW-CEA			
Benchmark 9.1	Describe how land surveying is used for many purposes during the design and construction of a project including establishing the topography of a site, setting control points, and establishing the location of project features.	PLTW-CEA	ELA.WHST.11-12.2.b ELA.SL.11-12.4	LA.12.2.1.b LA.12.3.1.a MA.12.1.3.a MA.12.1.3.d MA.12.2.5.b SC.12.1.1.d SC.12.1.1.g	When students <i>describe</i> information or ideas, they communicate their knowledge through either speaking or writing. To demonstrate full knowledge on the topic, students' presentations must include all the main ideas and relevant details on the subject (CC: ELA.WHST.11-12.2.b, ELA.SL.11-12.4; NE: LA.12.2.1.b, LA.12.3.1.a). Alignment presumes that students will select appropriate units of measurement and computation methods used in differential leveling during the construction of a project (NE: MA.12.1.3.a, MA.12.1.3.d, MA.12.2.5.b). Alignment presumes that students will select appropriate lab equipment and analyze results from soil sampling to determine soil characteristics important to the design and construction of a building (NE: SC.12.1.1.d,
Sample Performance Indicator 9.1.1	Use differential leveling to complete a control survey to establish a point of known elevation for a project.	PLTW-CEA			

Sample Performance Indicator 9.1.2	Analyze a site soil sample to determine the United Soil Classification System designation and predict soil characteristics important to the design and construction of a building on the site.	PLTW-CEA			
Benchmark 9.2	Engineers must consider parking requirements, pedestrian access, ingress and egress, landscaping, storm water management, and site grading when creating a site design.	PLTW-CEA		SC.12.1.1.d SC.12.1.1.g	Alignment presumes that students will select appropriate lab equipment and analyze results from soil sampling to determine soil characteristics important to the design and construction of a parking area (NE: SC.12.1.1.d, SC.12.1.1.g).
Sample Performance Indicator 9.2.1	Design appropriate pedestrian access, vehicular access and a parking lot for a commercial facility.	PLTW-CEA			
Sample Performance Indicator 9.2.2	Analyze a site soil sample to determine the United Soil Classification System designation and predict soil characteristics important to the design and construction of a building on the site.	PLTW-CEA			
Benchmark 9.3	Recognize that ingress and egress, parking, pedestrian, and handicapped access must be planned to efficiently and safely move traffic, goods, and people.	PLTW-CEA			
Sample Performance Indicator 9.3.1	Design appropriate pedestrian access, vehicular access and a parking lot for a commercial facility.	PLTW-CEA			

Benchmark 9.4	Understand how the characteristics of soils present on a site impact the design and construction of improvements to a property.	PLTW-CEA			
Benchmark 9.5	Appreciate how codes determine the type, sizing, and placement of site features such as parking lots, and entrances and exit roads, pedestrian and handicapped access, and storm water facilities.	PLTW-CEA	ELA.RST.11-12.6	LA.12.1..6.k MA.12.1.3.b MA.12.1.3.d MA.12.2.5.b MA.12.2.5.c	
Sample Performance Indicator 9.5.1	Estimate the increase in storm water runoff from a commercial site and create a preliminary design for a storm water storage facility.	PLTW-CEA			
Sample Performance Indicator 9.5.2	Apply Low Impact Development techniques to a commercial site design reduce the impact of development on storm water runoff quantity and quality.	PLTW-CEA			
Sample Performance Indicator 9.5.3	Follow specifications and codes during a design process.	PLTW-CEA			
Benchmark 9.6	Understand how the surface conditions and topography of site affect the quantity and quality of storm water runoff and the design of the storm water management system.	PLTW-CEA		MA.12.2.5.b MA.12.2.5.c	Alignment presumes that students will measure, apply appropriate units, make calculations, and convert between units of area and volume needed when estimating storm water runoff (NE: MA.12.2.5.b, MA.12.2.5.c).
Sample Performance Indicator 9.6.1	Estimate the increase in storm water runoff from a commercial site and create a preliminary design for a storm water storage facility.	PLTW-CEA			

Sample Performance Indicator 9.6.2	Given 3D architectural design software, document a commercial site design.	PLTW-CEA			
Standard 10	Students will understand the commercial building design problem.	PLTW-CEA			
Benchmark 10.1	Recognize people will work in teams to produce solutions to complex problems.	PLTW-CEA	ELA.SL.11-12.1	LA.12.3.3	
Sample Performance Indicator 10.1.1	Work individually and in groups to produce a solution to a team project.	PLTW-CEA			
Sample Performance Indicator 10.1.2	Create an architectural program, a project organization chart, and a Gantt chart and hold project progress meetings to help manage the team project.	PLTW-CEA			
Benchmark 10.2	Understand a legal description of property is used to identify real estate in a legal transaction and can be found in a deed, mortgage, plat or other purchase documents.	PLTW-CEA			
Sample Performance Indicator 10.2.1	Research codes, zoning ordinances and regulations to determine the applicable requirements for a project.	PLTW-CEA			
Sample Performance Indicator 10.2.2	Identify the boundaries of a property based on its legal description.	PLTW-CEA			

Benchmark 10.3	Describe how the selection of site and the project being planned are interrelated. A site should be thoroughly research to determine whether it is compatible with the project to be built.	PLTW-CEA	ELA.WHST.11-12.2.b ELA.SL.11-12.4	LA.12.2.1.b LA.12.3.1.a	When students <i>describe</i> information or ideas, they communicate their knowledge through either speaking or writing. To demonstrate full knowledge on the topic, students' presentations must include all the main ideas and relevant details on the subject (CC: ELA.WHST.11-12.2.b, ELA.SL.11-12.4; NE: LA.12.2.1.b, LA.12.3.1.a).
Sample Performance Indicator 10.3.1	Perform research and visit a site to gather information pertinent to the viability of a project on the site.	PLTW-CEA			
Sample Performance Indicator 10.3.2	Identify the criteria and constraints, and gather information to promote viable decisions regarding the development of their solution.	PLTW-CEA			
Benchmark 10.4	Recognize legal, physical, and financial conditions as well as the needs of the surrounding community should be taken into consideration when determining the viability of a project.	PLTW-CEA		MA.12.2.4.a	Alignment presumes that students will make sketches using geometric objects when communicating ideas about physical conditions needed for a project (NE: MA.12.2.4.a).
Sample Performance Indicator 10.4.1	Communicate ideas while developing a project using various drawing methods, sketches, graphics, or other media collected and documented.	PLTW-CEA			
Sample Performance Indicator 10.4.2	Investigate the legal, physical, and financial requirements of a project and consider the needs of the community to determine project viability.	PLTW-CEA			
Benchmark 10.5	Understand detailed planning and management of a project is essential to its success.	PLTW-CEA			

Sample Performance Indicator 10.5.1	Communicate ideas while developing a project using various drawing methods, sketches, graphics, or other media collected and documented.	PLTW-CEA			
Sample Performance Indicator 10.5.2	Develop an understanding of how software is used as a tool to aid in the solution and then the communication of a project.	PLTW-CEA			
Standard 11	Students will organize and carry out a commercial building and design presentation.	PLTW-CEA			
Benchmark 11.1	Critiques and reviews are used to inform and provide suggestions for improvement	PLTW-CEA	ELA.SL.11-12.1.d	LA.12.2.1.d	
Sample Performance Indicator 11.1.1	Conduct an oral presentation to present a proposal for the design and development of a commercial building project.	PLTW-CEA			
Benchmark 11.2	Presentations and displays of work provide the means to effectively promote the implementation of a project.	PLTW-CEA	ELA.SL.11-12.4-6	LA.12.3.1	
Sample Performance Indicator 11.2.1	Assemble and organize work from a commercial project to showcase the project in an effective and professional manner.	PLTW-CEA			
Sample Performance Indicator 11.2.2	Create visual aids for a presentation that include the appropriate drawings, renderings, models, documentation, and the rationale for choosing the proposal for project development.	PLTW-CEA			

Sample Performance Indicator 11.2.3	Conduct an oral presentation to present a proposal for the design and development of a commercial building project.	PLTW-CEA			
Benchmark 11.3	Recognize a well-done presentation will enhance the quality of a team's project.	PLTW-CEA			
Sample Performance Indicator 11.3.1	Create visual aids for a presentation that include the appropriate drawings, renderings, models, documentation, and the rationale for choosing the proposal for project development.	PLTW-CEA			
Sample Performance Indicator 11.3.2	Conduct an oral presentation to present a proposal for the design and development of a commercial building project.	PLTW-CEA			